CLAIMS

1. A quartz glass crucible for pulling up a silicon single crystal, comprising a crucible base body constituted of a semi-transparent quartz glass layer and a transparent quartz glass layer formed on an inner wall surface of the crucible base body, characterized in that no expanded bubbles equal to or more than 0.5 mm in diameter are present in a layer 1 mm in depth from an inner surface of the quartz glass crucible after the silicon single crystal is pulled up using the quartz glass crucible, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 400 to 1000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

2. A quartz glass crucible for pulling up a silicon single crystal, comprising a crucible body constituted of a semi-transparent quartz glass layer and a transparent quartz glass layer formed on an inner wall surface of the crucible base body, characterized in that no expanded bubbles equal to or more than 0.5 mm in diameter are present in a layer 1 mm in depth from an inner surface of the quartz glass crucible

after the silicon single crystal is pulled up using the quartz glass crucible, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 20 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 200 to 400 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

3. A quartz glass crucible for pulling up a silicon single crystal, comprising a crucible body constituted of a semi-transparent quartz glass layer and a transparent quartz glass layer formed on an inner wall surface of the crucible base body, characterized in that no expanded bubbles equal to or more than 0.5 mm in diameter are present in a layer 1 mm in depth from an inner surface of the quartz glass crucible after the silicon single crystal is pulled up using the quartz glass crucible, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 600 to 2000 kw, a

horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 1500 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min. --

4. A quartz glass crucible for pulling up a silicon single crystal according to any of claims 1, 2, or 3, wherein, in the transparent quartz glass layer before the silicon single crystal is pulled up, the maximum of diameters of bubbles is equal to or less than 0.2 mm, a total sectional area of bubbles is equal to or less than 20% and a gas content is equal to or less than 1 μl/g.

5. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 22 to 28 inches, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 400 to 1000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle

diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

6. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 22 to 28 inches, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 20 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 200 to 400 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

7. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 30 to 48 inches, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 600 to 2000 kw, a horizontal

distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 1500 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

8. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 22 to 28 inches, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 400 to 1000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min, and the powder layers in the mold are prepared under a reduced pressure by evacuating from an inside of the mold.

9. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 22 to 28 inches, wherein, with an arc

rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 20 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 200 to 400 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min, and the powder layers in the mold are prepared under a reduced pressure by evacuating from an inside of the mold.

10. A quartz glass crucible for pulling up a silicon single crystal according to claim 4, having a diameter in the range of 30 to 48 inches, wherein, with an arc rotation melting method, the base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 600 to 2000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 1500 mm, a particle

diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min, and the powder layers in the mold are prepared under a reduced pressure by evacuating from an inside of the mold.

11. A quartz glass crucible for pulling up a silicon single crystal according to claim 8, wherein the reduced pressure is in the range of 10 to 700 mm Hg.

12. A quartz glass crucible for pulling up a silicon single crystal according to claim 9, wherein the reduced pressure is in the range of 10 to 700 mm Hg.

13. A quartz glass crucible for pulling up a silicon single crystal according to claim 10, wherein the reduced pressure is in the range of 10 to 700 mm Hg.

14. A production method for a quartz glass crucible for pulling up a silicon single crystal, the quartz glass crucible having a diameter in the range of 22 to 28 inches, characterized in that, with an arc rotation melting method, a base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 400 to 1000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc

center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

15. A production method for a quartz glass crucible for pulling up a silicon single crystal, the quartz glass crucible having a diameter in the range of 22 to 28 inches, characterized in that, with an arc rotation melting method, a base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 20 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 200 to 400 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 800 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

16. A production method for a quartz glass crucible for pulling up a silicon single crystal, the quartz glass crucible having a diameter in the range of 30 to 48 inches, characterized in that, with an arc rotation melting method, a base body is prepared in a mold using silicon dioxide powder and an inner layer is formed on an

inner surface of the base body using silicon dioxide powder under conditions that the silicon dioxide powder has a gas content equal to or less than 30 μl/g and an OH group concentration equal to or less than 300 ppm, a heat melting power is applied in the range of 600 to 2000 kw, a horizontal distance from an arc center to a falling position of the silicon dioxide powder is in the range of 50 to 300 mm, a distance from the arc center to an inner surface of piled-up powder on a bottom of the base body is equal to or less than 1500 mm, a particle diameter of the silicon dioxide powder is equal to or less than 300 μm, and a feed rate of the silicon dioxide powder is equal to or less than 200 g/min.

17. A production method for a quartz glass crucible for pulling up a silicon single crystal according to any of the claims 14, 15, or 16, wherein the powder layers in the mold are prepared under a reduced pressure by evacuating from an inside of the mold.

18. A production method for a quartz glass crucible for pulling up a silicon single crystal according to claim 17, wherein the reduced pressure is in the range of 10 to 700 mm Hg.